Solutions may be e-mailed

(by Sunday, if possible)

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Question 1 Find a confluent and terminating rewrite system for the following equational theory:

$$\begin{array}{rcl} \epsilon * x & = & x \\ x * \epsilon & = & x \\ (x : y) * z & = & x : (y * z) \\ x * (y * z) & = & (x * y) * z \end{array}$$

Question 2 Find a confluent and terminating rewrite system for the above theory *plus* the following equations:

$$\begin{array}{rcl} r(\epsilon) & = & \epsilon \\ r(x : \epsilon) & = & x : \epsilon \\ r(x * y) & = & r(y) * r(x) \end{array}$$

Question 3 What happens if you add the rule

$$r(x) * y \quad \to \quad t(x, y)$$

to the system you obtained for the previous question?

Question 4 Find an ordered rewrite system for the following equational theory:

$$\begin{array}{rcl} x + 0 & = & x \\ x + s(y) & = & s(x + y) \\ x + y & = & y + x \\ d(x) & = & x + x \end{array}$$

using a recursive path ordering with precedence $+ > d > s > 0$.

Question 5 Show that there is a computable ordering and computable strategy such that, given any finite set of equations E and valid identity $s = t$, completion will prove that $E \vdash s = t$ by generating enough equational consequences of E to reduce both sides of the identity to the same term, without backtracking and undoing any simplification (contracting inference) step.